



Passport[®] Personal Alarm

Technical Manual

WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR USING OR SERVICING THE PRODUCT. Like any piece of complex equipment, the PASSPORT PERSONAL ALARM will perform as designed only if it is used and serviced in accordance with the manufacturer's instructions. OTHERWISE IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repairs.

CAUTION

For safety reasons, this equipment must be operated by qualified personnel only. Read and understand the instruction manual completely before operating.

In the U.S., to contact your nearest stocking location, dial toll-free 1-800-MSA-2222. To contact MSA International, dial 1-412-967-3354 or 1-800-MSA-7777.

This manual pertains to instruments with Serial Number prefix "C".

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Manufactured by
MSA INSTRUMENT DIVISION
P.O. Box 427, Pittsburgh, Pennsylvania 15230

MSA

Portable Instrument Warranty

1. **Warranty-** This product has a warranty on the chassis and electronics. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year such as, but not limited to, batteries, sensors, and pump drive units. Combustible gas sensors, oxygen sensors, carbon monoxide and hydrogen sulfide sensors, battery packs and pumps are limited to one year from date of sale. This warranty does not cover filters, fuses, etc. Certain sensors and other accessories not specifically listed here may have different warranty periods. This warranty is valid only if the product is maintained and used in accordance with Seller's instructions and/or recommendations. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning this product. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.**
2. **Exclusive Remedy-** It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and/or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.
3. **Exclusion of Consequential Damages-** Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

Important

The Passport Personal Alarm has three keypad versions:

- Two U.S. versions -
 - original model
 - current production model
- International version (shipped outside U.S.).

The three versions are *functionally identical* and are differentiated by the keypad pushbuttons on the Passport Alarm front panel.

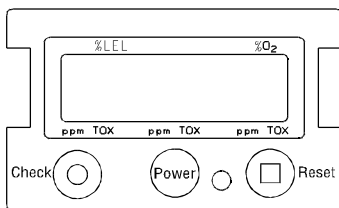


Figure 1. U.S. Version - Original

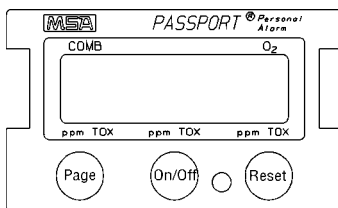


Figure 2. U.S. Version - Current Production

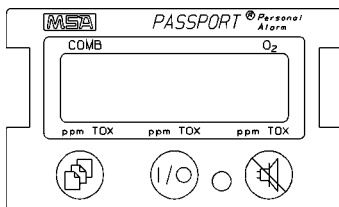


Figure 3. International Version

The U.S. versions use English words on the pushbutton descriptions, while the International version uses internationally-recognized symbols (or icons).

Illustrations in this manual are representative of the U.S. current production version (FIGURE 2). Refer to FIGURE 1 for the U.S. original version and FIGURE 3 for the International equivalents to the front panel pushbuttons.

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Chapter 1

Set-up

To ensure that the Passport Personal Alarm operates accurately, the user must refer to this Technical Manual to:

- Set the appropriate Internal Switch Settings
- Set the appropriate Alarm Levels
- Properly Calibrate the instrument
- Perform any necessary Troubleshooting and resulting maintenance procedures

Internal Switches

Passport Alarm operating parameters are controlled and adjusted by a set of switches located inside the unit. To access the switches, the instrument must be partially disassembled (FIGURE 1-1).

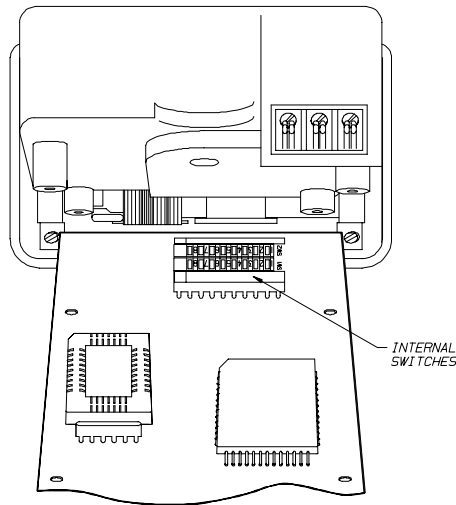


Figure 1-1.
Internal Switch

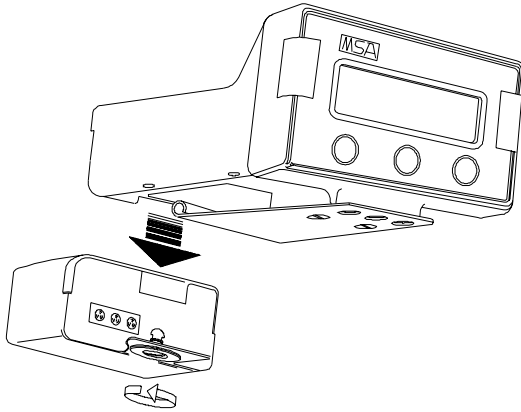


Figure 1-2.
Battery Pack Removal

1. Remove the battery pack (FIGURE 1-2).
2. Remove the sensor cover and sensors (FIGURE 1-3).
3. While holding the body of the instrument in place, remove the #1 "hold-down" screw (FIGURE 1-4).
4. Remove the rear case #2 "hold-down" screw (FIGURE 1-4).
5. Hold the display module by its sides, and slide out the internal chassis halfway.
6. Unplug the earphone connector from the chassis.

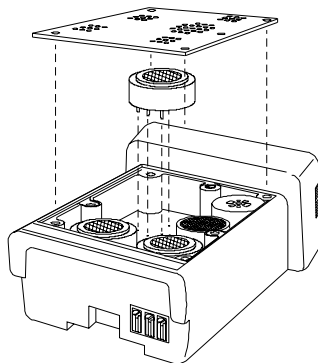


Figure 1-3.
Sensor Cover Plate

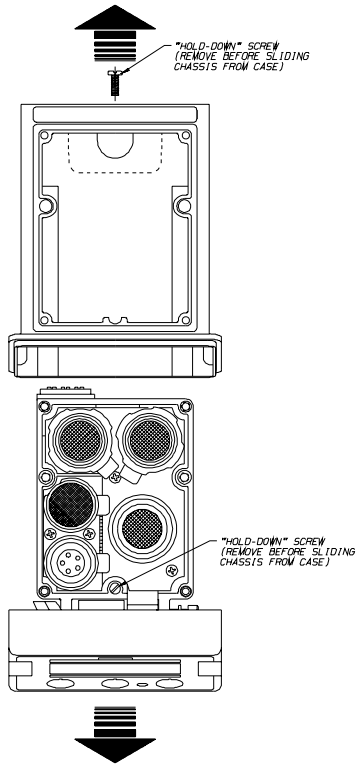


Figure 1-4.
Removing Chassis (sensors shown for reference)

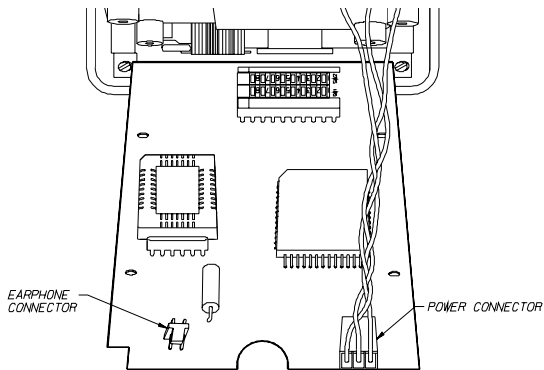


Figure 1-5.
Internal Connectors on the Main Electronics Board

7. Slide the chassis out completely.
8. Turn the chassis over with the sensor well facing down and the circuit board face up.
9. Remove the four mounting screws from the main electronics board.
10. Lift the main electronics board to a 45-degree angle, and unplug the power connect J6.
11. Lift the main electronics board until it is almost perpendicular with the chassis, and locate the two rows of switches, "A" and "B."

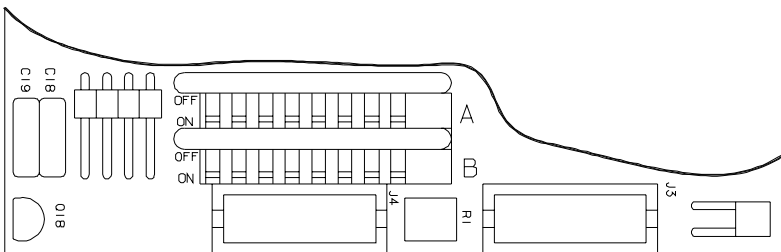
Switch Settings

Table 1-1 shows switch settings for normal operation.

Setting Alarm Levels

To change the instrument alarm setpoints:

1. Turn OFF the instrument.
2. Remove the battery pack.
3. Locate the internal switches as previously described.
4. Set switch A-1 to OFF. Refer to TABLE 1-2.
5. Reassemble the instrument.
6. Replace the battery pack.



*Figure 1-6.
Internal Switches*

Table 1-1. Internal Switch Settings for Normal Operation			
SWITCH "A":			
1 - ON: MEASURE (normal) operation, Passport Alarm will monitor for alarm conditions			
2 - Combustible Display ON: %CH ₄ (Methane) OFF: %LEL (Lower Explosive Limit)			
SENSOR	SWITCH "A"	ENABLE	DISABLE
Combustible Gas	3	ON	OFF
Oxygen	4	ON	OFF
Toxic Gas #1	5	ON	OFF
Toxic Gas #2	6	ON	OFF
Toxic Gas #3	7	ON	OFF
---	8	---	---
FUNCTION	SWITCH "B"	ENABLE	DISABLE
Fresh Air Setup	1	ON	OFF
TWA Display/Alarm	2	ON	OFF
STEL Display/Alarm	3	ON	OFF
Peak Readings	4	ON	OFF
Data Tagging (see NOTE below)	5	ON	OFF
---	6	---	---
---	7	---	---
Factory Use Only	8	OFF	OFF

NOTE Data Tagging is available in Passport Personal Alarms with Serial Numbers beginning with C-3 and higher or Software Version 3.3 or higher.

 **WARNING**

The Passport Personal Alarm does not provide any protection while the alarm levels are being set. To enable the alarms to function, the internal switches must be set for normal operation and the instrument turned ON.

Current alarm setpoints are displayed when the instrument is turned on. Only the setpoints for gas sensors selected by corresponding internal switches can be changed. Alarm points can be set in the following order:

- Combustible Gas
 - High Alarm

**Table 1-2.
Internal Switch Settings for Changing Alarm Setpoints**

SWITCH "A":			
1 - OFF: SET ALARMS, Passport Alarm will NOT monitor for alarm conditions			
2 - NO CHANGE			
SENSOR	SWITCH "A"	ENABLE	DISABLE
Combustible Gas	3	ON	OFF
Oxygen	4	ON	OFF
Toxic Gas #1	5	ON	OFF
Toxic Gas #2	6	ON	OFF
Toxic Gas #3	7	ON	OFF
---	8	---	---
FUNCTION	SWITCH "B"	ENABLE	DISABLE
---	1	---	---
TWA	2	ON	OFF
STEL	3	ON	OFF
---	4	---	---
---	5	---	---
---	6	---	---
---	7	---	---
---	8	---	---

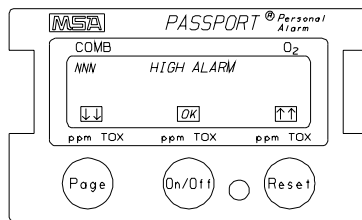
- Oxygen
 - Low Alarm
 - High Alarm
- Toxic Gas #1
 - High Alarm
 - Time Weighted Average (TWA)
 - Short Term Exposure Limit (STEL)
- Toxic Gas #2
 - High Alarm
 - Time Weighted Average (TWA)
 - Short Term Exposure Limit (STEL)
- Toxic Gas #3
 - High Alarm

- Time Weighted Average (TWA)
- Short Term Exposure Limit (STEL)

The first setpoint to be changed will be highlighted as shown in FIGURE 1-7.

⚠ WARNING

Improper adjustment of alarm setpoints may cause the instrument to fail to alarm in a hazardous atmosphere. Serious personal injury or death could result.



*Figure 1-7.
Combustible Alarm Setpoint Display*

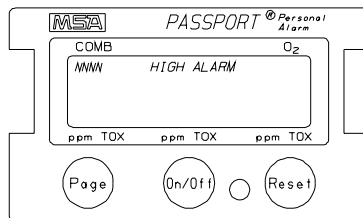
To lower the setpoint:

- Push the **PAGE** (DOWN) button.

To raise the setpoint:

- Push the **RESET** (UP) button.

Holding either button causes the setpoint to change continuously.

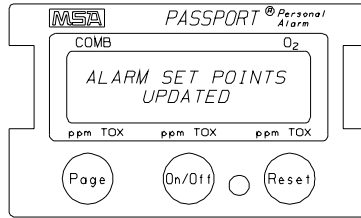


*Figure 1-8.
Accepted Setpoint Display*

To accept the setpoint:

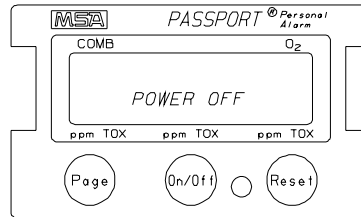
- Push the **ON/OFF** (OK) button; the new setpoint is stored in memory. The Passport Alarm moves automatically to the next setpoint.

When all selected alarm setpoints are set, a long beep sounds and the display reads:



*Figure 1-9.
Alarm Setpoints Updated*

Another long beep sounds, and the Passport Alarm turns OFF automatically.



*Figure 1-10.
Power OFF*

Reset internal switch A-1 to ON. Refer to TABLE 1-1

Chapter 2 Calibration

CAUTION

Before each days usage, sensitivity must be tested on a known concentration of calibration gas equivalent to 25 to 60% of full scale concentration. Accuracy must be within -0 to +20% of actual. Accuracy may be corrected by specific adjustment procedure.

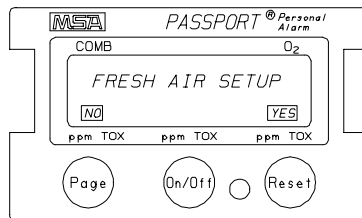
Optional Fresh Air Setup

The Passport Personal Alarm can be set to allow the user to automatically zero the measurement systems and calibrate the oxygen system when the unit is turned ON.

Activating the Fresh Air Setup Option

1. Locate the internal switches as previously described.
2. Turn switch B-1 to the ON position.
3. Reassemble the unit.
4. Replace the battery pack.

When this feature is activated and the instrument is turned ON, the Passport Alarm completes its self-tests and asks if a Fresh Air Setup is desired.



*Figure 2-1.
Fresh Air Setup?*

To Cancel Fresh Air Setup

- If the **PAGE** (NO) button is pressed or if no button is pressed within five seconds, the instrument does not perform a Fresh Air Setup. Instead, it goes on to operate in the normal measure mode and displays the Exposure page.

To Perform Fresh Air Setup

Press the **RESET** (YES) button within five seconds.

- The Passport Alarm begins to perform a Fresh Air Setup.
- Oxygen is set at 20.8 percent.
- All other gases are set at zero.

NOTE: If the Fresh Air Setup feature is activated and an error message is displayed, press the **RESET** button to exit the Fresh Air Setup and enter the Measure mode. This may occur if the original readings were outside of the limits for the Fresh Air Setup feature. This is to protect the user from zeroing out potentially hazardous gases. Expose the instrument to known fresh air and recalibrate.

WARNING

The Fresh Air Setup must only be used in fresh air; do not use it in atmospheres that are rich or deficient in oxygen, or that include combustible or toxic gases.

If you do, the Passport Alarm's calibration will be incorrect and its readings will be false. False readings will endanger the lives of those users whose safety depends on the instrument.

Do not use the Fresh Air Setup as a substitute for regular calibration checks.

Persons responsible for the use of the Passport Alarm must determine whether or not the Fresh Air Setup option should be used. The user's abilities, training, and normal work practices must be considered when making this decision.

Calibration Adjustment

Passport Alarm calibration can be adjusted easily by using gases of known mixtures and concentrations. Check the calibration each day before using your Passport Alarm.

Preparing to Calibrate

Before starting, be certain that the instrument is in normal fresh air, free of combustible or toxic gases. To prepare to calibrate:

1. Turn OFF the Passport Alarm.
2. Allow the instrument to stabilize for several minutes in fresh air at the temperature and air pressure of intended use.

WARNING

The Passport Personal Alarm does not provide any protection while the calibration is being adjusted. To enable the alarm function, the internal switches must be set for normal operation and the instrument must be turned ON.

Calibration Procedures

1. Install the pump module (if used) as shown:

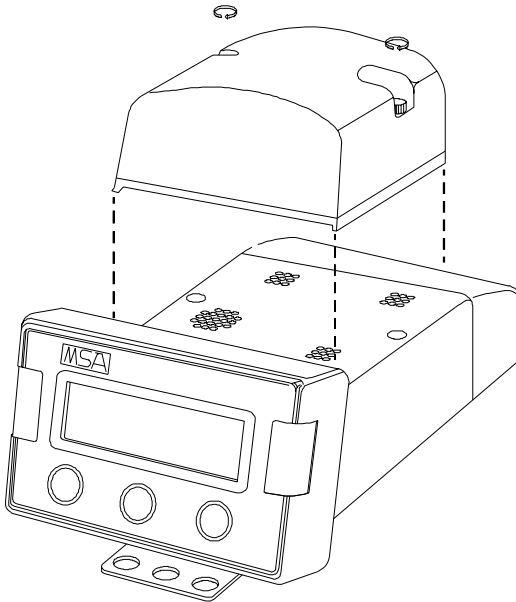


Figure 2-2.
Calibration Cap or Pump Module Installation

2. Push and hold the **PAGE** button and the **RESET** button, and then press the **ON/OFF** button. The instrument turns ON. The display is:

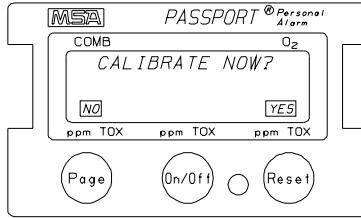


Figure 2-3.
Calibration - No/Yes?

To Cancel Calibration:

Press the **PAGE** (NO) button or wait five seconds.

- The Passport Alarm begins warming up and enters the Exposure display page.

To Continue Calibration:

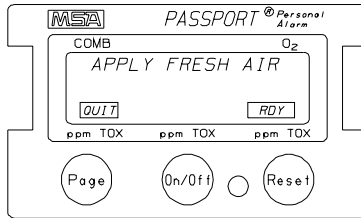


Figure 2-4.
Apply Fresh Air

3. Press the **RESET** (YES) button.
- **Display prompts you for Fresh Air.**

NOTE: At this point, allow the instrument to warm up for approximately one minute

To cancel:

Press the **PAGE** (QUIT) button.

- Instrument beeps and automatically shuts OFF.

To proceed:

4. Press the **RESET** (READY) button.

5. Wait approximately 15 seconds for the Passport Alarm to complete the fresh air adjustments.
 - During this time, the display appears:

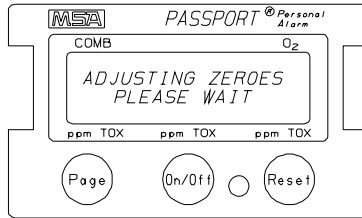


Figure 2-5.
Adjusting Zeroes

After the fresh air adjustments are made, the Passport Alarm is ready to complete calibration.

- The display appears:

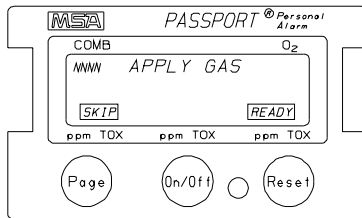


Figure 2-6.
Combustible Gas Calibration Display

6. Attach the calibration cap if the pump module is not being used. The user can calibrate the gas sensors in the following order:

- Combustible Gas
- Oxygen
- Toxic Gas #1
- Toxic Gas #2
- Toxic Gas #3

Only those gas sensors turned on by the corresponding internal switches are displayed and can be calibrated.

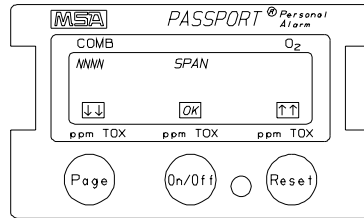


Figure 2-7.
Combustible Gas Span Adjustment

Oxygen and Toxic Gas Sensor Calibration

7. Using the Gas Tank (Optional)

- a. Attach a 0.25 lpm (liters-per-minute) Flow Controller to the gas tank.
- b. Attach a 6-inch Sample Line by screwing the connector adapter to the Passport Alarm Pump Module inlet.
- c. Attach the other end of the Sample Line to the 0.25 lpm Flow Controller.
 - The Passport Alarm Pump stops and does not restart until the gas tank nozzle is opened or an end of the sample line is opened.
- d. Turn the knob on the gas tank in a counterclockwise direction.
 - The Passport Alarm Pump Module automatically restarts.

8. Press the **RESET** (READY) button.
9. Wait for the readings to stabilize.

NOTE: During calibration, the display reading may appear more unstable than normal. The display's digital filtering has been disabled to provide the most rapid reading possible.

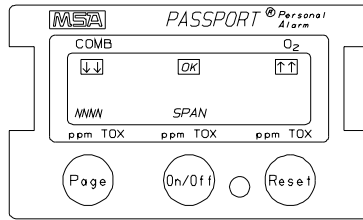


Figure 2-8.
Toxic Gas #1 Calibration Adjustment

10. After the display stabilizes, adjust the display reading to agree with the known amount of calibration gas.
 - a. Push the **PAGE** (DOWN) button to lower the reading.
 - b. Push the **RESET** (UP) button to raise the reading.
 - Holding either button causes the reading to change continuously.

11. After the combustible gas calibration is completed, press the **ON/OFF** (OK) button. The Passport Alarm automatically moves to the oxygen and then toxic gas calibrations. Each toxic gas calibration can be completed in the same way as the combustible gas calibration. It may be necessary to change gas samples to provide the proper gas.

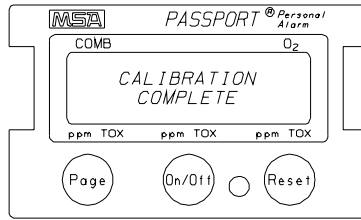
Press the **PAGE** (SKIP) button to skip calibration for any gases you do *not* want to change.

NOTE: The zero adjustment calibrates the oxygen sensor to 20.8%. Verify the oxygen reading is within the limits stated on the oxygen calibration cylinder.

Do not adjust the oxygen reading to the cylinder value, as slight variations may occur.

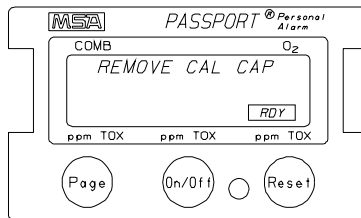
12. Change the gas sample as needed:

When all the selected calibrations are set, a long beep sounds and the display reads:



*Figure 2-9.
Calibration Update*

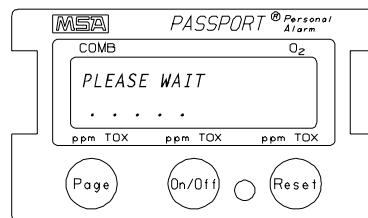
The following display appears:



*Figure 2-10.
Remove Cal Cap*

Remove the calibration cap or the calibration gas from the pump module. Press the **RESET** button.

The Display now reads:



*Figure 2-11.
Please Wait*

and allows the calibration gases to clear from the sensors (about 30 seconds).

A long beep sounds and the Passport Alarm turns OFF automatically:

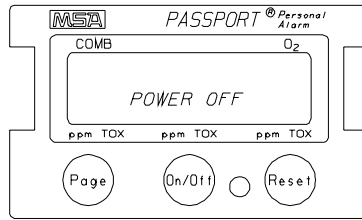


Figure 2-12.
Power OFF

Combustible Gas Display

The units of measurement for the combustible gas display may be changed by the user. The display may indicate either %LEL (% of Lower Explosive Limit) or %CH₄ (Methane by volume). The display is controlled by an internal switch.

Activating %LEL Display

1. Locate the internal switches as previously described.
2. Turn switch A-2 to the OFF position.
3. Reassemble the unit.
4. Replace the battery pack.

Activating %CH₄ Display

1. Locate the internal switches as previously described.
2. Turn switch A-2 to the ON position.
3. Reassemble the unit.
4. Replace the battery pack.

WARNING

Changing the switch requires instrument recalibration and alarm setpoint verification. Failure to do so can result in inaccurate readings.

Chapter 3 Troubleshooting and Maintenance

Troubleshooting

The Passport Personal Alarm will operate reliably for years when cared for and maintained properly. If the instrument becomes inoperative, follow the Troubleshooting Guidelines in TABLE 3-1. These represent the most likely causes of a problem. You may return inoperative instruments to MSA for repair.

**MSA Instrument Division
Service Department
Walden Road
Cranberry Township, PA 16066
1-800-MSA-INST**

To contact MSA International, please call:

1-412-967-3000 or 1-800-MSA-7777

When an inoperative component is located by using the guidelines, it may be replaced by using one of the following procedures:

Table 3-1. Troubleshooting Guidelines				
PROBLEM	REPLACE			
	BATTERY PACK*	DISPLAY MODULE	SENSOR	MAIN ELECTRONICS MODULE
Does not turn ON	√			√
Does not complete Self-Tests				√
Display segments missing or stuck		√		
"ERROR" message after battery installation				√
"ERROR" message during use				√
Battery pack does not hold charge	√			
Combustible sensor does not calibrate			√	
Oxygen sensor does not calibrate			√	
Toxic sensor does not calibrate			√	
Clock not holding time.				√
* Recharge or replace the cells before replacing battery pack.				
In all of the above cases and for any other problems, you may return the Passport Personal Alarm to MSA for repairs.				

Repair Procedures

Battery Pack Replacement

Remove the Battery Pack

1. Turn the "quarter-turn fastener" on the back of the instrument in a counterclockwise direction.
NOTE: Do not remove any other screws from the Ni-Cd battery pack.
2. Slide the battery pack away from the sensor face.

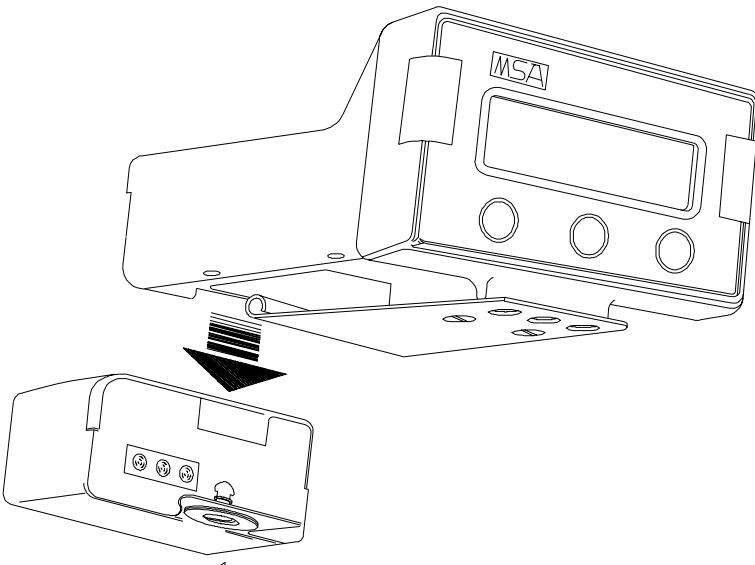


Figure 3-1.
Battery Pack Removal

Replace the Battery Pack

3. Examine the sliding battery contacts for damage.
4. Slide the battery pack toward the sensor face.
5. Turn the "quarter-turn fastener" on the back of the instrument in a clockwise direction.

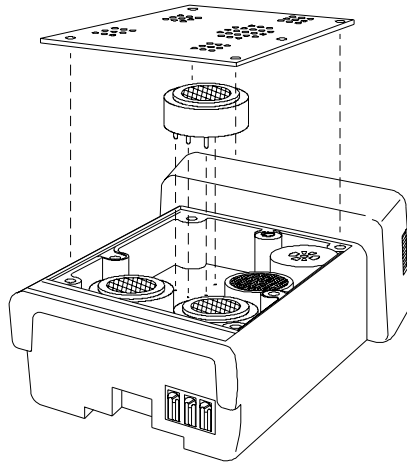


Figure 3-2.
Sensor Replacement

Sensor Replacement

1. Turn OFF the power, and remove the battery pack.
2. Remove the Pump Module or Calibration Cap, if installed.
3. Remove the sensor cover plate.
4. Unplug, remove, and properly dispose of the desired sensor.
5. If the replacement sensor is equipped with a shorting plate, clip or wire attached to its pins, remove it before inserting the replacement sensor.
6. Replace the sensor gasket
7. Align the sensor cover plate with the sensors, and be certain that it completely covers the sensors.
8. Recalibrate the instrument before using.

Main Electronics Board Replacement

CAUTION

Before handling the PC boards, ensure you are properly grounded; otherwise, static charges from your body could damage the electronics. Such damage is not covered by the warranty. Grounding straps and kits are available from electronics suppliers such as Radio Shack.

1. Turn the power OFF, and remove the battery pack.
2. Remove the Pump Module or Calibration Cap, if installed.
3. Remove the sensor cover screws.

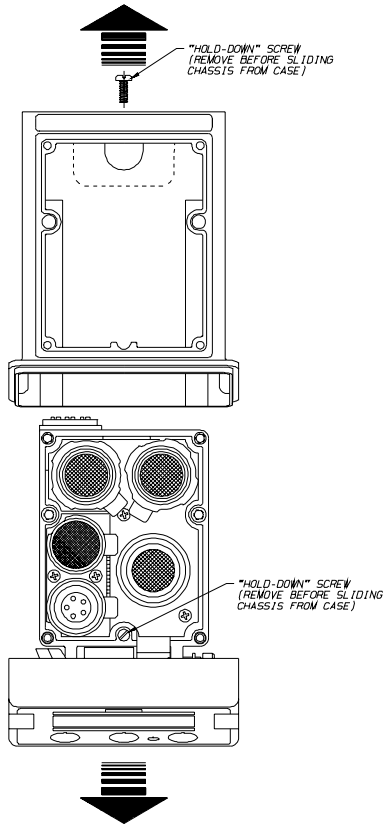


Figure 3-3.
Chassis and Sensor Removal

4. Remove the sensor cover plate.
5. Remove the "hold-down" screws.
6. Remove the sensors.
7. Slide the chassis out halfway.
8. Disconnect the ear-phone connector.

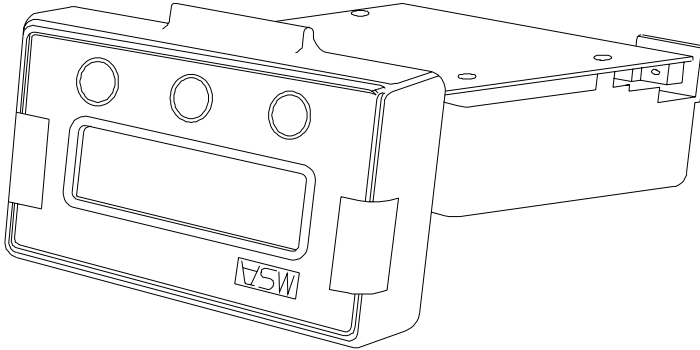


Figure 3-4.
Location of Mounting Screws

9. Completely slide out the chassis.
10. Remove the four main electronics board mounting screws.

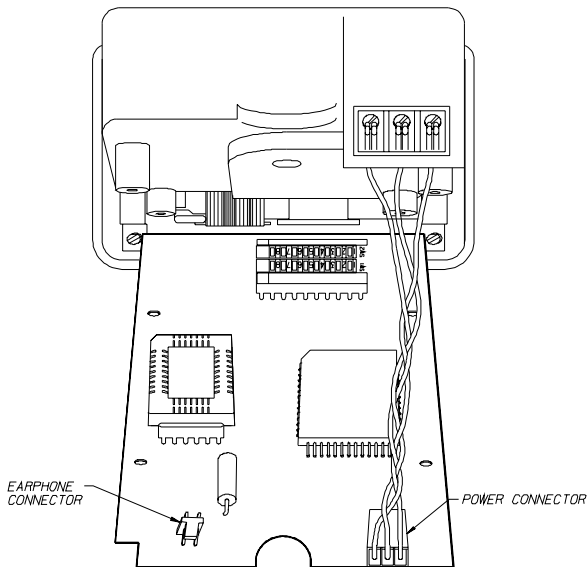


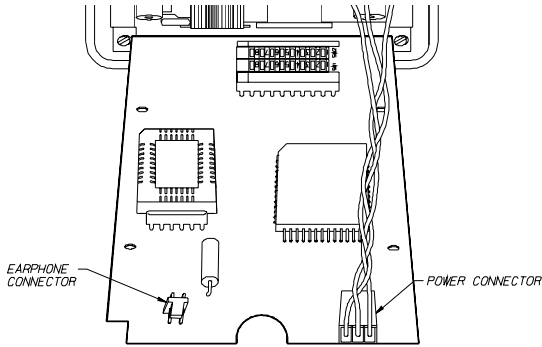
Figure 3-5.
Power Connector Removal

11. Turn the instrument over, and lift up the main board to a 45-degree angle; disconnect the power connector.
12. Lift up the board to about 90 degrees, and remove:
 - display connector
 - sensor connector
 - keypad connector
13. Remove the board.
14. Set the switches on the new main electronics board to the same positions as those set on the old Main Electronics Board.
15. Insert the new main electronics board.
16. Connect the
 - keypad connector
 - display connector
 - sensor connectorto the new board.
17. Connect the power connector.
18. Fasten the four module-board mounting screws.
19. Slide the chassis half-way into the case.
20. Connect the ear-phone connector.
21. Slide the chassis completely into the case.
22. Install the "hold-down" screws.
23. Install sensor cover plate, aligning the holes over the sensors.
24. Completely recalibrate the Passport Alarm.
25. Verify the alarm setpoints; adjust them if necessary.

Display Module Replacement

1. Turn the power off, and remove the battery pack.
2. Remove the Pump Module or the Calibration Cap, if installed.
3. Remove the sensor cover screws.
4. Remove the sensor cover plate.
5. Remove the "hold-down" screws.
6. Slide the chassis out halfway.
7. Disconnect the ear-phone connector.
8. Completely slide out the chassis

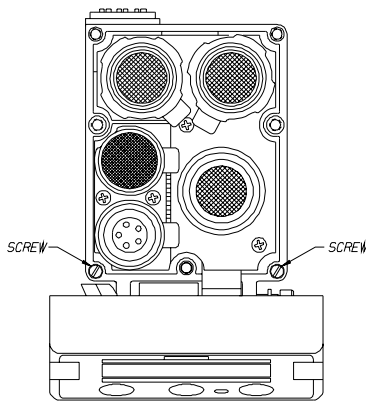
9. Turn the instrument over, and remove the four mounting screws.
10. Lift up the main electronics board to a 45-degree angle, and



*Figure 3-6.
Power Connector Removal*

disconnect the power connector.

11. Lift up the main electronics board to about 90 degrees. Remove:
 - display connector
 - sensor connector
 - keypad connector
12. Remove the two screws holding the display to the chassis.



*Figure 3-7.
Display-to-Chassis Mounting Screws*

- a. Remove the four screws holding the display module to the face piece.
13. Remove the display module.
14. Install the new display module.
15. Fasten the display mounting screws.
16. Connect the
 - keypad connector
 - display connector
 - sensor connectorto the main electronics module.
17. Connect the power connector.
18. Replace the four module mounting screws.
19. Slide the chassis half-way into the case.
20. Connect the ear-phone connector.
21. Slide the chassis completely into the case.
22. Replace the "hold-down" screws.
23. Replace the sensor cover plate, aligning the holes over the sensors.
24. Complete recalibration of the Passport Alarm is recommended as a performance check.

Sensor Board Replacement

1. Turn the power OFF, and remove the battery pack.
2. Remove the Pump Module or Calibration Cap, if installed.
3. Remove the sensor cover screws.
4. Remove the sensor cover plate.
5. Remove the "hold-down" screws.
6. Slide the chassis out halfway.
7. Disconnect the ear-phone connector.
8. Completely slide out the main electronics board
9. Remove the four main electronics-board mounting screws.
10. Turn the instrument over, and lift up the main board to a 45-degree angle; disconnect the power connector.
11. Lift up the board to about 90 degrees, and remove:

- display connector
 - sensor connector
 - keypad connector
12. Remove the board.
 13. Remove all sensors.
 14. Remove the four mounting screws.
 15. Remove the Sensor Board from the chassis, and replace it with a new Sensor Board, reinstalling the screws and sensors, from 13 and 14 above.
 16. Connect the
 - keypad connector
 - display connector
 - sensor connectorto the main electronics module.
 17. Connect the power connector.
 18. Replace the four module mounting screws.
 19. Slide the chassis half-way into the case.
 20. Connect the ear-phone connector.
 21. Slide the chassis completely into the case.
 22. Replace the "hold-down" screws.
 23. Replace the sensor cover plate, aligning the holes over the sensors.
 24. Calibrate the Passport Personal Alarm.

Chapter 4

Parts List

Table 4-1. Parts List	
PART	PART NO.
Pump Module	497430
Calibration Cap	497367
Battery Pack, Standard Ni-Cd Rechargeable	496990
Probe - 1 ft.	800332
Probe - 3 ft.	800333
Sampling Line - 5 ft.	497332
Sampling Line - 10 ft.	497333
Sampling Line - 15 ft.	497334
Sampling Line - 25 ft.	497335
Replacement Filter, Probe	801582
Charger, Omega 120 VAC	494716
Charger, Omega 220 VAC	495965
Charger, Omega 110/220 VAC, Five Unit	801759
Charger, Omega 12 volt	800525
Calibration Kit Model RP with 0.25 lpm Regulator	477149
Calibration Gas - LEL pentane simulant / 15% O ₂	478192
Calibration Gas - LEL pentane simulant / 15% O ₂ ; 60 ppm CO	478191
Calibration Gas - 10 ppm H ₂ S	467898
Calibration Gas - LEL pentane simulant / 15% O ₂ ; 60 ppm CO and 10 ppm H ₂ S	804770
Calibration Gas - LEL pentane simulant / 15% O ₂ ; 10 ppm H ₂ S	804769
Quick-connect Calibration Adapter	636246
Calibration Kit; Ampoule Type	471735
Main Electronics Board	813112
Display Module	806557
Sensor Board	806397
Combustible Gas Sensor	478537
O ₂ Sensor	480566
CO Sensor	636240
H ₂ S Sensor	636241

Appendix A

Supplemental Instructions for Passport Instruments Supplied with Chlorine (Cl₂) Sensors

Due to a natural characteristic of chlorine gas, ambient humidity and sample line material can react with chlorine to cause the chlorine concentration *response* to be lower than *actual* concentrations. It is therefore necessary when sampling for chlorine to use a dry Teflon* sample line.

1. If condensation in the sample line is suspected, dry the sample line by running the pump module with the sample line attached. This must be done in a low humidity, non-condensing atmosphere.
2. To verify operation of a Passport unit equipped with a chlorine sensor, perform the Passport response check with the sample line in place to verify that chlorine will reach the sensor.
3. Since limited sample line lengths will *not* react with chlorine gas, calibrate using the shortest possible tubing to connect the calibration cylinder to the Passport pump inlet. Cut the black tubing supplied with the calibration kit to a two-inch length to provide the best calibration result.

NOTE: Use only regulator P/N 809945 with calibration cylinder P/N 806740.

NOTE: Use and accuracy of ampoules is very dependent on the skill and experience of the operator. Due to these human factors not in our control, variations up to $\pm 25\%$ may be noted in calibration and response checks.

The chlorine compatible pump (P/N 811719) has internal parts made of materials specially chosen to minimize their effects on chlorine. Due to differences in construction, this pump has a higher current draw than the standard pump; up to 20% shorter run time may be noticed.

*Trademark of the du Pont Company

⚠ WARNING

Use only pump module (P/N 811719) and Teflon sample lines (P/Ns 800972 or 811187) to sample for chlorine. Use of any other pump or sample line reduces the amount of chlorine gas reaching the sensor and results in inaccurate readings which could cause injury or death.

To ensure proper operation, the user must perform a response check prior to each day's use. Failure to perform this response check could cause improper readings and injury or death could result.

NOTE: The life of the chlorine sensor is not as long as that of other sensors supplied for the Passport unit. The chlorine sensor is warranted for six months from the date of purchase.

Interference Gases Cross Sensitivity	
SAMPLE	PASSPORT RESPONSE
10 ppm H ₂ S	-2
100 ppm CO	0
5 ppm Cl ₂	5
50 ppm HCl	-1
10 ppm HCN	0
5 ppm NO ₂	8
50 ppm NO	1
10 ppm SO ₂	0

Appendix B

Passport Integral Pump Module (P/N 814105) Instructions

The Integral Pump Module is to be used with the Passport Personal Alarm; it provides fast response time with a low, unobtrusive profile.

NOTE: The Integral Pump Module can be used for combustible gas, oxygen, carbon monoxide and hydrogen sulfide only.

To install the Integral Pump Module:

1. Turn OFF the power and remove the battery pack.
2. Remove the sensor cover plate by removing the four corner screws and two center plastic screws, if installed (FIGURE B-1). Store these parts in a convenient location in the event the Passport unit is re-configured to a diffusion unit.
3. Remove all gaskets from the sensors but leave the sensors in place.
4. All sensor positions (maximum of four) must be filled with a sensor or an inactive sensor plug, and the combustible sensor must be in place. If four sensors are not in place, ensure that an inactive sensor plug is in place. See TABLE B-3 for part numbers of the inactive sensor plugs.

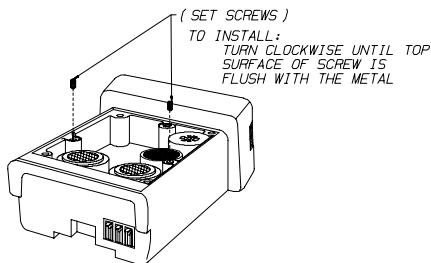


Figure B-1.

NOTE: Sensor position number 2 (next to the oxygen sensor) must remain empty as the pump and motor will be located here.

⚠ WARNING

If all sensor positions are not filled, improper readings may occur, which could result in injury or death.

5. Pull straight up, remove and save the combustible and oxygen sensors for re-installation.
6. Locate the two screws holding the sensor board to the chassis (positioned between the oxygen and combustible sensors); remove and store these screws with parts removed in Step 2.
7. Install the plastic sensor holder (P/N 811723) contained in Kit (P/N 814105). Place the round sleeve in the combustible sensor location and the flat portion in the oxygen sensor location. Use the two slotted screws (P/N 636227) contained in the Kit to attach the sensor holder to the sensor board. Re-install the oxygen and combustible gas sensors.

⚠ CAUTION

Place the plastic holder flat on the sensor board. A cable is located next to the oxygen and combustible sensor location; place the plastic holder under this cable. If the holder is placed on top of the cable, the cable may break.

8. Using the supplied allen wrench (P/N 60208), install the two Set Screws (P/N 638419) into the two larger holes where the Pump Module screws are normally inserted. The top of the screws should be flush with the metal threads (FIGURE B-1).
9. Install the cover gasket (P/N 496373).
10. Align the Integral Pump Module over the sensor well and gently position it in the recess around the well. The Integral Pump Module should now align over the cover gasket.
11. Insert and begin to tighten the four long screws (P/N 637820) into the four Pump Module holes. When the first screw begins to bite, move to the next until all have begun to seat. Snug the four screws; then, go back and tighten firmly (FIGURE B-2).

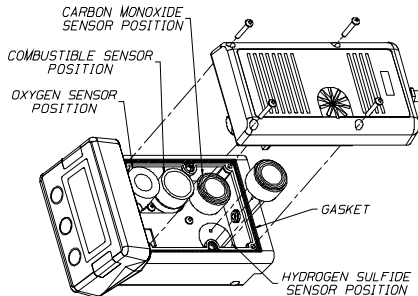


Figure B-2.

12. Attach the battery pack. After the self check and power down, turn the Passport ON.
 - The measure page appears.
13. Block the pump inlet and verify that the pump alarm occurs.
 - "PUMP" appears in the display.
 - Alarm LEDs and horn activate.

⚠ WARNING

This check must be done before each day's use, and the pump alarm must occur when the inlet is blocked. If the pump alarm does not occur, the pump may not be pulling a sample to the sensors and inaccurate readings may occur; this could result in injury or death. Have the pump serviced if the pump alarm does not function.

14. Verify the Passport calibration response by performing a calibration check or Bump Test. If the readings are not within the limits stated on the cylinder, re-calibration is necessary.

⚠ WARNING

A calibration check must be performed before each day's use. If the readings are not within the limits established by your company or stated on the cylinder, inaccurate instrument readings may occur, which could result in injury or death.

15. Sample lines of up to 50 feet may be attached to the inlet. See TABLE B-1 for part numbers and lengths. Repeat the blocked flow test performed in step 13.

Pump Module Replacement

1. Turn the power OFF and remove the battery pack.
2. Remove any optional sampling equipment.
3. Remove the four screws mounting the pump module and lift pump module away from the instrument.
5. Verify that the sensors and pump-to-instrument gasket are in place in the instrument. Also, verify that the pump crank arm on the new pump module is centered on the pump eccentric bearing. (Equal amounts of bearing should show on either side of the crank arm.)

6. Secure the pump module in position with the four screws, and tighten screws until no gap exists between the pump module and the instrument case. Do not over-tighten the screws.
7. Verify proper pump module operation per the Passport Instruction Manual.

NOTE: Pump Filter System maintenance is described in the Passport Instruction Manual, General Maintenance.

Rubber Manifold Replacement

1. Remove the pump module.
2. Peel the rubber manifold off of the two plastic case posts, which protrude through the pump printed circuit board.
3. Align the holes in the new manifold with the posts, and press directly over the posts with a finger or thumb to firmly seat the manifold against the pump board.
4. Replace the pump module.

Pump Board Replacement

1. Remove the pump module and the manifold.
3. Unplug the motor connector and tilt the pump board up and away from the motor at a 45 degree angle.
4. Unplug pressure switch from sockets on the pump board.
5. Plug the pressure switch into the new pump board.
6. Set the pump board fully into the case, making sure not to pinch the pressure switch tubing.
7. Connect the motor connector and replace the manifold.
8. Replace the pump module and verify proper pump module operation per the Passport Instruction Manual.

Pump and Drive Replacement

1. Remove the pump module and the manifold.
2. Unplug the motor connector and remove the pump board.
3. Remove the two screws from the pump mounting collar located nearest the connector end of the motor.
4. Slide tubing off the pump block to remove pump and drive module.
5. Attach tubing to the new pump and drive module.

6. Secure pump and drive module in place with the two screws and mounting collar; do not over-tighten screws.
7. Replace pump board and manifold; reconnect the motor connector.
8. Verify that the crank arm of the pump is approximately centered on the eccentric bearing (equal amounts of bearing should show on either side of the bearing).
9. Re-install the pump module.
10. Verify proper pump module operation per the Passport Instruction Manual.

Pump Motor Replacement

1. Remove the pump and drive module.
2. Loosen the pump frame clamping screw and slide motor and attached eccentric and bearing from the frame.
3. If the eccentric and bearing are to be used again, remove them from the motor shaft by prying lightly with a small screwdriver. (Push only on the plastic eccentric, never on the bearing.)
4. Press eccentric and bearing completely onto the new motor shaft (end of motor shaft should be flush with end of the eccentric).
5. Slide motor into the frame and press the crank arm onto the bearing. The crank arm must be centered on the bearing, with equal amounts of bearing showing on either side of the crank arm. A .030" spacer or feeler gauge can be used to properly position the crank arm from the flat surface on the eccentric.
6. Use a small ruler or straight edge to adjust the motor so that the end is flush with the rounded pillars on the frame and the motor terminals are straight up and down; then, tighten the clamp screw.
7. Re-install the pump and drive module, pump board and manifold into the pump case.
8. Replace the pump module and verify proper operation per the Passport Instruction Manual. The pump should draw a minimum of 195 ml/minute against a resistance of 30 inches of water suction.

Rebuilding the Pump and Drive

1. Remove pump and drive module and motor with attached eccentric and bearing.
2. Remove the four screws attaching the pump plate, gasket and pump block to the plastic frame.
3. Remove the pump block and diaphragm assemblies.
4. Place the new diaphragm and block assemblies on the frame. (The crank arm supplied with the rebuilding kit is marked with a black dot; align the crank arm so that the side with the dot faces the motor. Align the block so the arrow points toward the motor.)
5. Place the gasket and plate on the pump block, and loosely attach these parts to the pump frame with the four screws.
6. Slide the motor into the frame and press the crank arm onto the bearing. The crank arm must be centered on the bearing so equal amounts of bearing can be seen on either side of the crank arm. A .030" spacer or feeler gauge can be used to properly position the crank arm from the flat surface of the eccentric.
7. Use a small ruler or straight edge to adjust the motor so that the end is flush with the rounded pillars on the frame and the motor terminals are straight up and down; then, tighten the clamp screw.
8. Make sure the diaphragm is free to "find" its optimum position; then, press the plate toward the frame and tighten the four screws sequentially and evenly. Do not over-tighten the screws.
9. Any time a pump and drive is disassembled and re-assembled, proper operation must be verified per the Passport Instruction Manual. The pump should draw a minimum of 195 ml/minute against a resistance of 30 inches of water suction.

Table B-1. Optional Sampling Equipment Parts List

PART	PART NO.
Probe - 1 ft., peek	800332
Probe - 1 ft., Teflon	497600
Probe - 3 ft., peek	800333
Sampling Line - 5 ft.	497332
Sampling Line - 5 ft., coiled	807469
Sampling Line - 10 ft.	497333
Sampling Line - 15 ft.	497334
Sampling Line - 25 ft.	497335
Replacement Filter, Probe	801582

Table B-2. Filtering System Replacement Parts List

PART	PART NO.
Dust Filter, Pump Module	808935
Water Trap Hydrophobic Filter, Pump Module	710917
Filter O-Ring	637009
Filter Maintenance Kit <ul style="list-style-type: none"> • Filter Cover • Screws • Dust Filters • O-Ring • Teflon Filter • Filter Frit 	812968

Table B-3. Parts List

PART	PART NO.
Slotted Screws for Sensor Nest	636227
Sensor Nest	811723
Allen Key	60208
Allen Screw	638419
Pump Screw	637820
Rubber Manifold	814104
Pump Board	811934
Screwdriver	638304
Pump Rebuilding Kit	805341
Eccentric and Bearing	485244
Replacement Modules	
Gasket	496373
Inactive Oxygen Plug	812377
Inactive Toxic Sensor Plug	812378